Name:

at1117paper: Complete the Square (v0)

Example

A square's edge length is x feet. A rectangle has a height of x feet and a width of 38 feet. Their combined area, found by adding the square's area and the rectangle's area, is 663 square feet. What is the value of x?

Example's Solution

$$x^2 + 38x = 663$$

To complete the square, add $\left(\frac{38}{2}\right)^2 = 361$ to both sides.

$$x^2 + 38x + 361 = 1024$$

Recognize the left side is now a perfect-square trinomial. Factor the left side.

$$(x + 19)^2 = 1024$$

Undo the squaring.

$$x + 19 = \pm\sqrt{1024}$$

$$x + 19 = \pm 32$$

Subtract 19 from both sides.

$$x = -19 \pm 32$$

In this geometric example, we are only concerned about the positive solution. So,

$$x = 13$$

Question 1

A square's edge length is x feet. A rectangle has a height of x feet and a width of 60 feet. The total area, of the square and rectangle, is 1309 square feet. What is the value of x?

$$x^2 + 60x = 1309$$

$$x^2 + 60x + 900 = 2209$$

$$(x + 30)^2 = 2209$$

$$x + 30 = \pm 47$$

$$x = 17$$

Question 2

A square's edge length is x feet. A rectangle has a height of x feet and a width of 18 feet. The total area, of the square and rectangle, is 144 square feet. What is the value of x?

$$x^2 + 18x = 144$$
$$x^2 + 18x + 81 = 225$$
$$(x + 9)^2 = 225$$
$$x + 9 = \pm 15$$
$$x = 6$$

Question 3

A square's edge length is x feet. A rectangle has a height of x feet and a width of 42 feet. The total area, of the square and rectangle, is 520 square feet. What is the value of x?

$$x^2 + 42x = 520$$
$$x^2 + 42x + 441 = 961$$
$$(x + 21)^2 = 961$$
$$x + 21 = \pm 31$$
$$x = 10$$